IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

DEWANJEE, P.K., et al.

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Serial No.: 09/137,393

Title: POLYURETHANE MATERIAL FOR TWO AND THREE PIECE GOLF BALLS AND METHOD

Examiner: SERGENT, R.

Group Art Unit: 1711

Att'y Docket: DSCK-525-C3C

DECLARATION UNDER RULE 132

I, GEORGE R. WALLACE, do hereby declare and say that:

My home address is 103 Catawbah Road, Clemson, South Carolina.

I have a BS degree in Chemical Engineering from North Carolina State University and an MS degree in Chemical Engineering from the University of Utah. The focus of my studies was on polymers and my thesis was entitled 'Relationships Between the Mechanical Properties of Thermoplastic Polyurethane Elastomers and the Structure of the Diisocyanate Unit'.

I was employed by the Packing Division of Parker Hannifin Corporation for seven years from 1991 through 1998, where I developed polyurethane elastomers for use in hydraulic and pneumatic sealing applications. When I left Parker Hannifin Corporation I held the position of Manager – Polymer Research. In that capacity, I was responsible for studying the effect of modifications to polyurethane chain structure on injection molding operations and finished article performance; for formulating polyurethane elastomers to

meet a wide range of price and performance targets; and for designing polyurethane resin manufacturing processes.

In 1998 I joined Dunlop Slazenger Group where I am currently involved with all aspects of the design and commercialization of golf ball products, including polyurethane covered golf ball products based directly on art and practices disclosed in U.S. Patent Application 09/137,393. I am currently Director of Product Development, a position I have held for the past six months. Prior to assuming this position, I was Senior Research and Development Project Manager.

I have reviewed U.S. Patent Application 09/137,393 entitled Polyurethane Material for Two and Three piece Golf Balls and Method. I have studied the entire specification to include closely analyzing the claims and the drawings. I am totally familiar with the language of the claims and conversant with the scope thereof. I completely understand the invention as claimed. The golf ball toward which this declaration is directed has a polyurethane cover consisting of Toluene Diisocyanate (TDI), polytetramethylene glycol (PTMEG), dimethylthio-2,4-touluendiamine (E-300), diethyl-2,4-toluenediamine (E-100) and additives as embodied in amended claim 30. The cover is produced using a cast process. The golf ball also has a solid rubber center surrounded by thread windings. The golf ball as embodied in amended claim 30 is sold in the market under the name MAXFLI Revolution. The golf ball as claimed is superior to competitive models in its method of manufacture and in its performance properties, as is demonstrated by its sales performance. Each of these aspects is addressed below.

The chemistry of the MAXFLI Revolution golf ball cover was designed to ensure that the manufacture of the golf ball is fast, easy, inexpensive, and does not damage the

inner-core of the golf ball. The use of a TDI/PTMEG prepolymer with a blend of E-100 and E-300 as the curing agent provides a fast, single-step molding operation (i.e. the core of the ball is covered by a dimpled, polyurethane cover in one unit operation). The operation requires about twenty minutes to cover a wound core with a dimpled, polyurethane cover, which is ready for further, typical finishing operations.

Varying the relative amount of E-100 and E-300 present in the MAXFLI Revolution golf ball cover controls the rate at which the urethane mixture reacts. Varying the relative amounts of E-100 and E-300 is easy to do with a great deal of accuracy, as the curative represents roughly ten-percent of the urethane formulation. Other methods of controlling the rate of a polyurethane reaction are not so easy. Using the temperature of the mold to control the rate of reaction is extremely difficult because it is difficult to maintain tight control of the mold temperature in a continuous manufacturing process. Using the heat that is held in the molds to control the rate of reaction necessitates that the molds are hot enough to accelerate the urethane reaction. If the molds are too hot, the reaction will be too fast, and vice versa if the molds are too cold, then the reaction will be too slow. Alternatively, using a catalyst to control the rate at which the urethane mixture reacts is also extremely difficult. Typically, urethane catalysts are present and extremely effective at accelerating the urethane reaction at levels of about 0.05-percent by weight of a urethane mixture. Controlling the addition of a critical component at such a small concentration is extremely difficult. Adding too much catalyst results in the reaction being too fast, and vice versa if too little is added, then the reaction is too slow.

The raw materials used to produce the MAXFLI Revolution golf ball cover in question are relatively low cost materials. TDI is lower in cost than its typical competitor, 4,4'-diphenylmethane diisocyanate (MDI). PTMEG is a relatively expensive polyol, however, the use of less expensive polyester polyols is known in the industry to reduce the resilience of the resultant polyurethane. Reduced resilience is not a desirable attribute in a golf ball cover material. E-100 and E-300 are relatively inexpensive materials in comparison to other diamines. 3,3'-dichloro-diphenylmethane (MBOCA) is a less expensive alternative; however, as opposed to E-100 and E-300, it is a solid a room temperature and presents potential health hazards, both of which are undesirable traits. Other typical diamines used to cure polyurethane systems include the 'Polamine' and 'Unilink' family of diamines, both of which are much more expensive than the E-100 and E-300 diamines.

The chemistry of the MAXFLI Revolution golf ball cover was designed to ensure that the manufacture of the finished golf ball does not damage the inner-core of the golf ball. Typical polyurethane systems require that the manufacture of resultant polyurethane articles take place at temperatures elevated above 180°F. This is either due to the need to melt the reactive components, to reduce the viscosity of the reactive components to a desirable level, to drive the reaction to a point that will allow de-molding of the article in a reasonable amount of time, or some combination of the above. Additionally, the urethane reaction is exothermic and thus generates energy that causes the reacting mixture to increase in temperature. Furthermore, typical polyurethane systems require that an extensive 'post-cure' annealing process take place above room temperature. Exposure to elevated temperatures is detrimental to wound golf ball cores. Wound cores

contain polymers in a stressed (stretched) state. Exposure to elevated temperatures causes the entropy of the stressed polymers to increase, which can cause the stressed polymers to exceed their tensile strength and thus break. Furthermore, exposure to elevated temperatures causes the stressed polymers to form crosslinks in the stressed state, thus reducing the stress on the polymer. This is not a desirable outcome. The raw materials used to produce the MAXFLI Revolution polyurethane golf ball cover are liquids at room temperature, are low enough in viscosity at temperatures less than 145°F to be pumped and mixed successfully, and react quickly enough at temperature less than 180°F to allow for the resultant golf balls to be de-molded in a reasonable amount of time. Additionally, because the reactive mixture is relatively cool to begin with, the rise in temperature of the reacting mixture due to the exothermic release of energy does not result in excessive damage to the wound core of the golf ball. Furthermore, a 'post-cure' annealing process at an elevated temperature is not required. All of this results in a golf ball that performs in a superior manner.

There are three factors that define how a premium golf ball performs: the distance that the golf ball travels when it is hit, how much the golf ball spins when it is hit, and how soft the golf ball 'feels' when it is hit. How far a ball travels when it is hit and how much it spins when it is hit are quantifiable performance indicators. How a golf ball feels when it is struck is a subjective perception different to every golfer, however, Dunlop Slazenger Group has developed a scale called the 'Feel Index' that attempts to quantify the 'feel' of a golf ball. The 'Feel Index' is determined by evaluating the hardness of the golf ball and of its constituent components, the thickness of the layers of the golf ball, and the spin rate of the golf ball under certain conditions. The resultant 'Feel Index' of a

golf ball is a higher number if the 'feel' is softer. The distance that the MAXFLI Revolution travels when struck with a Driver is greater than the distance that the Titleist Professional or Titleist Tour Prestige travel. According to quarterly competitive audit data generated by the Dunlop Slazenger Group Outdoor Research Center, the MAXFLI Revolution travels 275.1 yards, the Titleist Professional travels 267.0 yards, and the Titleist Tour Prestige travels 261.0 yards when struck with a Driver. Additionally, according to quarterly competitive audit data generated by the Dunlop Slazenger Group Outdoor Research Center, when struck with an 8-Iron, the MAXFLI Revolution spins at 7222 rpm, the Titleist Professional spins at 6653 rpm, and the Titleist Tour Prestige spins at 6812 rpm. The more a golf ball spins when it is struck with an iron, the more 'workable', and thus more desirable, it is. Furthermore, according to quarterly competitive audit data generated by the Dunlop Slazenger Group Outdoor Research Center, the 'Feel Index' of the MAXFLI Revolution is 82.9, the 'Feel Index' of the Titleist Professional is 81.3, and the 'Feel Index' of the Titleist Tour Prestige is 85.3. Thus, the MAXFLI Revolution travels farther when struck with a Driver, spins more when struck with an Iron, and 'feels' firmer than the Titleist Tour Prestige. In addition, the MAXFLI Revolution travels farther when struck with a Driver, spins more when struck with an Iron, and 'feels' softer than the Titleist Professional. Thus, the MAXFLI Revolution provides greater distance and spin than its nearest competitors and at the same time satisfies the market need for 'feel' with a single solution.

The performance characteristics of the MAXFLI Revolution golf ball which are attributable to the combination of elements embodied in amended claim 30 are validated by the following fact: One year after its introduction, the MAXFLI Revolution had

captured 2.4-percent of the U. S. On and Off Course golf ball market. That market share represented sales in excess of $900,000 per month for the Dunlop Slazenger Group.

All statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 8 of the United States Code, and that such willful false statement may jeopardize the validity of the application or any patents issuing thereon.

Signed:

George R. Wallace

Date: September 19, 2000